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HELENA, MONTANA.

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"The science of disease prevention, if properly applied, can add fifteen years to the present average length of human life."—Prof. Irving Fisher, Yale.

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RABIES.

By Dr. W. J. Butler, State Veterinarian.

Rabies, or hydrophobia, has not in the past demanded our attention in Montana, but due to the extensive outbreak of the disease among dogs, wolves, coyotes, as well as horses and cattle in neighboring states it is possible that we may, ere long, have to cope with this disease.

According to official health reports hydrophobia was practically unknown west of the Mississippi River until 1909, but since that year its spread has been steady until at the present time, in the northern part of California, Nevada, Oregon, Washington and Idaho, the disease has assumed a serious aspect not only to the human family, but to the live stock industry. Coyotes and wolves have become infected and they, being unmindful of regulations, have scattered the disease over a much greater territory than if the trouble had been confined to domestic dogs. In Nevada they have raised a fund of approximately $100,000.00 to fight the disease, and most of this fund has been raised by the stockmen for the protection of their live stock. The Biological Department of the United States Department of Agriculture has employed hunters to eradicate predatory animals and these hunters, in conjunction with the state authorities and forest rangers, have done wonderfully good work in certain of the infected localities. The American National Live Stock Association, the National Wool Grower's Association and the Public Health Service with State Health Officers, at a meeting held at Salt Lake City, passed resolutions asking Congress to appropriate money for the eradication of predatory animals, and hydrophobia. In Montana we have at the present time thirteen hunters employed by the United States Biological Department and these hunters are mostly stationed along the state line to kill coyotes and other predatory animals along the border and to prevent, as far as is possible, the introduction of the disease by coyotes into the State. To further protect and safeguard our interests The Live Stock Sanitary Board has prohibited the importation of dogs from any state or territory of the United States, the District of Columbia, the Dominion of Canada, or the Republic of Mexico unless they are accompanied by a statement from the state or government health officer or the state veterinarian that rabies has not

existed for the past nine months within a radius of one-hundred miles of the origin of the shipment, and also by a statement from the owner or agent of the animal that the dog or dogs are to the best of his knowledge free from disease and have since birth, or during the past nine months, been at all times within the radius designated by the official health officer or state veterinarian. A copy of these statements must be forwarded to the State Veterinary Surgeon at Helena, Montana, so that we are kept cognizant of all dogs coming into the state. These regulations, of course, do not apply to performing animals for temporary stay in Montana.

There seems to be a great deal of misconception regarding rabies in the mind of the general public. This, for many reasons, is unfortunate and I am convinced it is the duty of every health officer to inform the general public the actual facts regarding this disease. Rabies, or hydrophobia, is as we know a specific disease caused by a specific, although at the present time an unknown, micro-organism, and it cannot be transmitted from one animal to another, or to the human family, by mere contact or association, but can only be transmitted through the bite of an infected animal, or by the licking of a wound or abrasion by an infected animal. It has been stated that the disease in certain animals such as skunks and wolves is more virulent than in others. Whether the disease is actually more virulent in these animals or whether it is simply due to the nature of the wound authorities are not agreed upon. But we do know that a deep puncture wound is much more serious and productive of a more virulent form than a slight surface wound, providing of course, that the wound has been caused by an infected animal.

but simply to call the attention of the health officers to its close proximity to Montana, and to one or two important points. All animals which may be apparently mad are not

It is not the intention of this article to describe rabies in detail but simply to call attention of the health officers to its close proximity to Montana, but there are one or two points which I would like to call attention to. The first is that all animals which may be apparently mad are not suffering from hydrophobia. Many an innocent pup has been declared mad and a hue and cry set up for his capture and

destruction simply because, especially during hot summer weather, he may have been teased by some boys, or he have had a slight attack of indigestion, or be suffering from worms, which caused him to roll on the ground, with the result that some person became suspicious and then the hue and cry started. Naturally the dog ran and saliva flowed more or less profusely from his mouth. The further he ran the more excited he and his pursuers became and the more convinced they were that he was suffering from hydrophobia. If a dog, or an animal of any kind, is suspected to be suffering from rabies he should be captured and confined in as quiet a manner as possible and held for proper observation. If he shows true symptoms of hydrophobia he should be destroyed and his brain, packed well in borax, should be sent in to the proper authorities for microscopic examination, and animal innoculation if necessary. A dog which is suspected of suffering from rabies should never be clubbed to death or shot through the brain. The animal may be killed by shooting through the neck just as easily as by shooting through the head, and then the brain may be observed and the proper positive or negative diagnosis made.

THE HOUSE FLY IN RELATION TO PUBLIC HEALTH IN MONTANA.

Article 2. The House Fly as a Disease Carrier.

By R. R. Parker.

In the previous article of this series it was explained that preventive medicine had to do with the prevention of disease. There are 600,000 deaths annually in the United States from diseases which are preventable. All diseases, the germs of which are carried by the house fly, are of this character. As far as this insect is concerned, therefore, two fundamental means of preventing such disease are indicated, —first to prevent flies from contaminating themselves by controlling the sources of contamination and second, to control the flies. How these two principles may be applied will be fully explained in Article 3.

In discussing the house fly as a disease carrier, we must first understand the means by which flies carry disease germs. These were indicated when considering the habits of this pest. There are three ways and they result either in contaminating our food or our bodies. Filth of all sorts over which the fly walks when feeding or depositing its eggs cling to the hairs on its legs and body and is afterward scraped off on food in stores or in our homes, and on our bodies. Disease germs, however, are not only carried on the outside of the fly, but also in the intestine. This results in two more sources of bacteria. (1) Fly specks, which the flies deposit when emptying their intestines are prolific sources of disease organisms. (2) Perhaps the most disgusting act of the fly is its habit of vomiting up liquid food mixed with saliva which it often does to moisten solid food, such as sugar. "Vomit spots" are commonly seen on the windows. By these three means disease germs are left on our food and in various other places.

Flies will often feed on the fly specks deposited by other flies and may become infected with disease organisms in this way. These, of course, then in turn pass through their intestines and are left in all sorts of places.

Some idea of how immense numbers of disease germs may be distributed in these various ways just described above

may be gained by noting a few of the results of investigation, for instance, flies captured in insanitary portions of cities have been found to carry from 800,000 to 500,000,000 bacteria, a large proportion of which are intestinal germs. In cleaner areas the number of bacteria carried was much smaller—21,000 to 100,000. Flies struggling in milk or other fluids leave many bacteria behind them, even into the hundreds of thousands. Flies captured in places where milk is handled and exposed carry more bacteria than flies captured in other places in the same vicinity, probably due to the flies infecting the milk in which bacteria will multiply in enormous numbers, and then reinfecting themselves, a vicious cycle that is often repeated. Other observations during which flies were examined from dwelling houses showed 75 per cent to have intestinal bacteria in their intestines. This percentage unquestionably would depend on the relative cleanliness of any given locality. Flies that are captured on swill also have large numbers of faecal bacteria in their intestines. Further examples might be given, but these are sufficient to show that flies carry many bacteria both on their bodies and in their intestines and that many of these are of the kind that cause diseases of the human intestines.

It has been shown that flies carry disease organisms in various ways. Further light is thrown on the possibility of infected flies contaminating our food when we consider the frequency with which faecal matter is deposited. It has been demonstrated that after feeding male house flies may deposit 25 fly specks during a period of less than two days before their intestines are empty, female flies may deposit 35. When working with certain other flies the number is still larger, 40 for males and 86 for females. Most of the fly specks are deposited within the first day. When flies are feeding continuously the number of fly specks is even larger and also depends on the kind of food on which they have been feeding. Some substances, such as sputum, cause diarrhoea in the flies and the spects are larger and more frequently deposited. "Vomit spots" may be even more frequently left than faecal matter. Thus we see that after a fly has fed on any substance containing disease germs that these germs may be left in a great many different localities during the wanderings of the fly during the next one or two days and sometimes longer, but flies are not at all careful

in choosing the places where they leave their filth and human food in stores, and houses serve their convenience as well as any other place or substance. The writer has often referred to flies as the most active living agent in the spread of disease germs, except perhaps man himself. It may be that they are even the most active during the season in which they are abundant. For example, let us suppose that a consumptive spits on the sidewalk. Man has performed his part and left infected material in **one** place, but flies are especially attracted to tuberculous sputum. If only a single fly fed on it, this fly could easily by means of "vomit spots" and fly specks leave the germs in at least half a hundred different places during the next two days, but that only one fly would visit the sputum would be very improbable, more likely several hundred might regale themselves on this choice morsel so that infected material originally deposited in one spot may be spread to several hundred places over a considerable area, and when we think of our open privies and garbage dumps which contain large quantities of filth and which are so often left exposed to be visited by incredible numbers of flies, what wonder is it that flies which frequent both these places and the food in our homes are deemed one of man's worst enemies. Indeed, it is with but a small measure of self respect that we can view ourselves when we permit such conditions to exist.

Not only do flies frequent and feed on such filth, but they breed in it as well. A single neglected garbage pile or privy may breed hundreds or thousands of flies.

In towns where people store their water in barrels the water may easily become infected by the flies which go to them for water. This is especially true when flies fall into the water, their struggles releasing large numbers of bacteria from the surface of their bodies.

Another important consideration in the spread of disease organisms by flies is the distances which they travel. To determine just how important this question is in Montana, the State Board of Entomology carried on investigations at Miles City during the summer of 1915 and it was demonstrated that flies which breed out from a manure pile or any other suitable substance will spread to every part of a city of equivalent size in about two weeks. Flies may travel at least two miles in any direction from their breeding place.

We have but few cities in Montana so large but that any person who permits flies to breed on his premises is guilty of furnishing a continual supply of these pests for the benefit of every one of his fellow townspeople. Not only does he furnish flies, but in every fly he furnishes an active agent for spreading disease germs. These organisms of various diseases will live from several days to two weeks on the body of a fly and hence, may be left on food at long distances from their original source.

It is hard in the light of all this evidence, to find any redeeming features in the house fly and its kin. If it has any, it is to be found in the often-suggested fact, that, by its numbers, it furnishes an index to sanitary conditions. Flies cannot exist without filth in which to breed, hence, if we find no flies in a town we are reasonably certain that the waste production is cared for in a decent and sanitary manner. Conversely, where flies abound, filth is sure to be correspondingly plentiful.

All the evidence points to house flies, in our climate at least, as being particularly concerned in the transmission of intestional diseases and diseases which may have their origin from the intestine. It is apparent that this fact, which is well recognized, agrees with what we have learned about the fly and its habits. It frequents and feeds both on faecal matter and other substances which contain intestinal bacteria and on human food which we take into our stomachs. Nothing could be more logical and convincing. The diseases which particularly concern us in Montana at the present time are typhoid fever, summer diarrhoea (also known as infantile diarrhoea and sometimes as cholera infantum) and tuberculosis.

Typhoid Fever. Perhaps this disease, which is considered by some to be equally a scourage with consumption in this country, has received the most attention as a house-fly-borne-disease because the conditions incidental to it are extremely favorable for fly transmission. The germ of typhoid is found in the stools and urine of those infected and may be present in them for months and even years after the patient has recovered. Persons who thus pass the typhoid germs for long periods after recovery are known as "typhoid carriers." In some localities at least four per cent of typhoid patients have been shown to be persistent carriers

of the disease germ. In asylums and public institutions of similar character such persons are often found. What wonder then, knowing the filth-to-food habit of flies that they have ranked next to water and milk in the spread of this disease. Under some conditions, such as concentration camps, they have even been recognized as the agent of first importance. Such was the decision of the Commission appointed to study typhoid fever in our army camps at the time of the Spanish-American War. Great Britain went through the same experience during the South African campaign. The success of Japan against Russia has been partly attributed to the attention given to sanitary details of this nature.

In cities, however, there is far less excuse for the spread of typhoid by flies. With the improvements of the sewage system and the passing of the outdoor privy the danger from this source under city conditions may be reduced to unimportance if proper care and foresight are used. In our cities and towns in Montana, however, either systems of sewage disposal are entirely lacking or are only partly utilized and the privy is everywhere in evidence even in some of the largest cities. This must needs be so in many cases. Small towns must rely on the privy and cities commonly extend their sewer systems as their funds permit, but at least we can make our privies fly proof and properly treat their contents so that danger of contagion will be reduced to a minimum.

Flies have been shown in some instances to be responsible for typhoid epidemics through the inoculation of milk at dairies where they had access, both to the milk and to infected stools in open privies. This indicates the importance of maintaining sanitary conditions in the country is the source of so much of our food.

On the supposition that one case of typhoid fever in every five is caused by fly transmission, it was estimated in 1913 that the annual economic loss through this agency was $70,000,000, in the United States.

Summer Diarrhoea. Of equal, if not even greater importance, is the apparent guilt of the house fly in the spread of summer diarrhoea. How many helpless babies die each year, victims of this common malady, through pure neglect to provide clean conditions under which to bring them up.

In 1908 nearly 200,000 children under five years of age died in the registration area of the United States, and of these more than 50,000 died of epidemic diarrhoea. This is only a record of fatal cases, but the number of children actually sick with this disease would have been vastly in excess of the figures given. In older people the effects of the disease are not so serious and it does not attract such widespread attention. In New York City it has been shown that the advent of sanitary conditions demanded for the control of the house fly has brought about a marked decrease of this disease.

Flies which have walked over or fed upon infected stools may transmit the disease by feeding on milk or other food which is to be fed to the baby and by contaminating the nipple of the nursing bottle. Fly specks and "vomit spots" containing the germ may be rubbed from window panes on the fingers and transferred to the mouth.

Consumption. This disease is caused by a germ which may be found in every part of the body and are perhaps most commonly in the lungs, intestines, liver and urinary system. From the standpoint of fly transmission the resistance of the germ to adverse conditions is important. In the dried sputum they may remain alive for months and for several weeks in sputum that is allowed to putrify. Even in the sunlight, which is a very active agent in killing germs, they may live for a day. Since the germ of consumption is eliminated from the body in three ways; in the sputum, stools and urine, the possibility of flies becoming contaminated is only too evident. Flies in hospitals where this disease is treated have been found to deposit the germ in the fly specks in large numbers and animals fed on food which such flies polluted have died of this diseease. Flies may carry the germ in their intestines for several days and infect food at considerable distances from the point where they became contaminated. How important the possibility of fly transmission is may be judged from the fact that the "vast majority of all cases of lung tuberculosis are of intestinal origin and there is no doubt that pulmonary tuberculosis can originate by swallowing tubercle bacilli." Perhaps one case of consumption in every twenty is due to transmission by flies.

Though the diseases which have just been briefly discussed are the most important to us in Montana, there are others

in the spread of which the house fly may either play an important part or which it is suspected may occasionally be fly-borne. Among these are dysentery, cholera, smallpox, measels, erysipelas, anthrax, glanders, diptheria, leprosy and venereal diseases.

Flies of various sorts are also sometimes found in the cavities of the nose and ear and not uncommonly in such cases the results are very serious. Sometimes fly eggs or maggots are taken into the intestines with food or again enter by other means and cause serious disturbances. These infestations are usually due to uncleanly habits with respect to the body or the case of food.

ROCKY MOUNTAIN SPOTTED FEVER.

A Report of Laboratory Investigations of the Virus.

By L. D. Fricks, Surgeon, United States Public Health Service.

During 14 years of investigation by different workers the following facts bearing upon the nature of the virus of Rocky Mountain spotted fever have been determined:

Man, rhesus monkeys, and at least six varieties of small wild rodents found in the Rocky Mountain region are susceptible to infection, while the larger domestic animals are generally immune. Of the laboratory animals, guinea pigs and white rats (Mus norvegicus albinus) are highly susceptible, while white mice (Mus musculus albinus) are apparently immune.

The virus is transmitted to susceptible animals, including man, by the bite of infected wood ticks (Dermacentor), recovery being followed by complete immunity. No other biting arachnid or other insect has been found capable of transmitting the virus. The transmission is not mechanical. since a tick once infected remains so, the virus multiplies in the tick and the female tick transmits the virus to her progeny. The virus may be propagated indefinitely in guinea pigs without loss of virulence by weekly blood inoculations, but dies within a few days outside the animal body. It will not pass through an ordinary Berkefeld filter under moderate pressure, and many attempts to cultivate it aerobically in the usual laboratory media have failed.

Wilson and Chowning, in 1902, described a piroplasm in the red blood cells of Rocky Mountain spotted fever cases seen in fresh blood smears both stained and unstained, but subsequent workers have failed to confirm their findings.

Ricketts reported diplococcoid bodies occasionally seen in fresh blood smears stained with Giemsa stain and many small bacilli found in infected tick eggs. He appears to have considered these as different forms of specific microorganism, but afterwards found similar bacilli in noninfected tick eggs. Ricketts reported the agglutination of this bacillus found in tick eggs by immune guinea pig serum in dilutions of 1 to 320, but was unable to cultivate the organism.

Recent Investigations of the Virus.

In connection with the field campaign conducted by the Public Health Service for the purpose of ascertaining the measures best adapted to the eradication of Rocky Mountain spotted fever from a community, and for determining the present areas of infection in the Rocky Mountain region, laboratory investigations of the virus have been carried on both in the field laboratory at Victor, Mont., and at the Hygienic Laboratory, Washington. It is believed that the findings are of sufficient interest to warrant a preliminary report thereon at the present time.

All attempts made to cultivate the virus on many different media aerobically have failed, despite the fact that the virus circulates freely in the blood stream, 0.1 c. c. of blood frequently being sufficient to infect a guinea pig.

Attempts were made two years ago to grow the virus anaerobically by mixing infected guinea pig blood with freshly melted and properly cooled glucose agar and glucose ascitic agar, in different dilutions, with and without the addition of normal guinea pig kidney. No uniform results were obtained; occasionally, however, anaerobic diphtheroid bacilli were encountered, but inasmuch as they were all found nonpathogenic for guinea pigs they were abandoned.

Following the announcement of the discovery of the "Bacillus typhi exanthematici" by Plotz, and because of the close clinical resemblance between Rocky Mountain spotted fever and typhus fever, the different anaerobic bacilli, referred to above, which have been encountered since in cultures, have been studied more carefully.

Ten strains of these anaerobic bacilli have been isolated; some from dilute guinea pig serum plus normal guinea pig kidney planted with infected blood, some from glucose ascitic agar plus normal guinea pig kidney planted with infected blood, and one from freshly boiled 1 per cent glucose broth in fermentation tube in which 5 c. c. of infected guinea pig blood had been planted.

These bacilli have not been found with anything approaching the frequency with which Plotz was able to recover "Bacillus typhi exanthematici" from typhus cases; but in the writer's routine work only from 5 to 10 drops of infected blood were used for planting, that amount being well above the minimum infective dose for guinea pigs. Plotz, on the contrary, regularly used 2 c. c. or more of typhus blood.

All of the 10 strains referred to are strict anaerobes, growing equally well in deep stabs on freshly melted glucose agar and ordinary agar, and in fresh glucose broth in fermentation tubes.

These organisms are nonpathogenic to guinea pigs, are not agglutinated by immune guinea pig serum, and do not show complement fixation with immune serum when used as antigen. The macroscopic method of agglutination was easily employed with cultures grown on fresh glucose broth in fermentation tubes. (Microscopically an apparent clumping of the bacilli is nearly always seen.)

These organisms, recovered from spotted fever guinea pigs, resemble very closely morphologically and culturally the two strains recovered from typhus guinea pigs by Hasseltine and Neill at the Hygienic Laboratory and the strain of **Bacillus typhi exanthematici** kindly furnished by Dr. Plotz.

Anaerobic Fluid Media Cultures.

In an endeavor to cultivate the Rocky Mountain spotted fever virus in fluid media under lessened oxygen pressures, the following technique was evolved at the field laboratory, Victor, Mont.:

Articles required:

Ten c. c. homeopathic vials, rubber stoppers to fit.

One-fourth inch glass tubing in 6-inch lengths.

One hand vacuum pump.

A constriction was drawn in the glass tubing, and a small hole, into which the tubing would fit snugly, was burnt in the rubber stopper. The stoppers with tube inserted and

the vials were sterilized separately. After the vials had been filled with 8 c. c. of media and inoculated, the stoppers were driven in tightly and sealed with paraffine, and the glass tube was attached to the hand pump. After from 5 to 30 minutes' exhaustion the glass tube was sealed at the constriction previously made and the culture then placed in the incubator.

While there was no exact measure of the vacuum obtained, or of its duration, it was possible to inhibit completely the growth of aerobic organisms by this method when so desired.

The media used were human serum and guinea pig serum with normal salt solution in different dilutions (1 to 2 and 1 to 3) and ascitic fluid undiluted; a piece of fresh guinea pig kidney was added at the time of inoculation in practically all instances. The material employed in inoculating the media consisted of infected guinea pig blood and tissues, blood from human cases of spotted fever, and infected tick eggs.

The following is a brief summary of the results obtained: Forty-five series of vials were planted. In the beginning so much time was consumed in searching smears made from the cultures for micro-organisms that it was decided to depend entirely upon animal inoculations, followed by immunity tests, in order to determine if possible the presence of the living virus in the cultures.

Ninety-seven guinea pigs were inoculated from these cultures and later tested for immunity by the injection of 0.5 c. c. of known spotted fever virus.

The cultures tested were from two days to one month old, the majority being less than two weeks old. All the guinea pigs injected with cultures less than two weeks old, when later given the immunity test, developed spotted fever.

Three guinea pigs out of ten inoculated with cultures 21 to 25 days old, either showed definite lesions of spotted fever or were immune to the spotted fever virus, as shown below:

Series No.	Culture medium.	Material planted.	Method.	Animal inoculations.	Immunity tests.	Remarks.
C1—June 15, 1915.	8 c. c. dilute human serum —|— normal g. p. kidney.	5 drops seventh day g. p. blood.	Air exhausted, vial sealed kept at 37°.	July 7, 5 drops injected into g. p.	G. p. immune to spotted fever virus injected June 30 and again on Aug. 6, 1915	G. p. showed temperatur above 40° C June 17 to 22, 1915.
D2—June 17, 1915.	.....do.....	7 drops human spotted fever blood.	.....do.....	June 29, 5 drops injected into g. p. D2a. July 9, 5 drops injected into g. p. D2b.	G. p. D2a injected Aug. 28 developed spotted fever. G. p. D2b injected Aug 13 and found immune.	G. p. D2b showed characteristic lesions of spotted fever following injection of July 9, 1915.
H3—July 15. 1915.	.....do.....	Infected tick eggs crushed.	.....do.....	Aug. 10, 5 drops injected into g. p.	G. p. immune to spotted fever virus injected Aug. 28, 1915	

Inasmuch as the Rocky Mountain spotted fever virus ordinarily dies within 24 to 48 hours when kept at a temperature of 37°, as the dosage of the cultures injected was much less than the minmum infective dose of fresh virus, and as in the inoculation of several hundred guinea pigs no naturally immune guinea pig has been encountered, it seems reasonable to conclude that a multiplication of the virus occurred in the cultures C1, D2, and H3.

Centrifugation of the Virus.

Ricketts was unable to throw down the virus from guinea pig and monkey serum when diluted with equal parts of salt solution, even after prolonged centrifugation (six hours). Centrifugation with greater dilutions of normal salt solution has been employed by the writer several times successfully for the purpose of freeing the virus from a coccus contamination. In this way, by injecting different layers of the centrifugal material, a layer was found which would produce spotted fever in the inoculated guinea pig, without carrying over the contaminating coccus.

By increasing the dilution to 1 part of serum to 8 or 10 of salt solution it was found that the spotted fever virus could be thrown down completely by four to six hours' centrifugation, as is shown in the following experiment:

After defibrinating 10 c. c. of spotted fever blood and centrifugating for 15 minutes, 1 c. c. of the serum was pipetted off and diluted with 10 parts of normal salt solution.

This was then centrifuged for four and one-half hours at about 2,000 revolutions per minute. Ten c. c. of the supernatant fluid was carefully drawn off and injected into guinea pig S2. This pig showed no reaction whatever, and later developed spotted fever when inoculated with the virus; while guinea pig S1, inoculated with three drops of the sediment, developed spotted fever on the eighth day following inoculation and showed all the characteristic lesions of the disease as seen in the guinea pig. This experiment has been repeated many times with similar results.

Microscopical Examination of Spotted-Fever Blood.

Stimulated by the fact that the virus of Rocky Mountain spotted fever does not pass through a Berkefeld filter (N) under a pressure of 1 atmosphere, various investigators of the disease have spent much time in searching fresh blood smears for the causative organism, but without agreement as to findings.

During the last three years the writer has examined many blood smears prepared and stained by all the well-known methods, from human cases and from the known susceptible animals, particularly guinea pigs and white rats. Frequently there have been found in spotted fever blood, stained by the Giemsa method, extra corpuscular granules, singly and in pairs, staining bright red and highly refractile; also, similar bodies within or in close proximity to the erythrocytes. The intracellular bodies are usually surrounded by a pale halo. The presence of these granules was considered significant, but it has been impossible to differentiate them with certainty from the granules sometimes found in normal blood.

By dilution and centrifugation a method for concentrating and distinguishing these bodies appears to have been found, the best results having been obtained in the following manner: Ten c. c. of infected blood is withdrawn by heart puncture, defibrinated, and immediately centrifuged for 15 minutes. One c. c. of the surface serum is then pipetted off and diluted with 10 c. c. of normal salt solution in an ordinary centrifuge tube. One c. c. of the remaining serum, containing some of the upper layers of red cells, is treated in the same way. These fluids are then centrifuged for 6 hours, the supernatant fluid is carefully poured off, and smears are made from the drop of sediment remaining and stained over night with dilute Giemsa stain.

The serum smears show many bright red granular bodies, singly and in pairs, highly refractile, accompanied by larger light-blue bodies, and all surrounded by a pale-blue matrix, the whole mass being rather indistinct but not encountered in the controls. The red blood cells appear to take the stain normally, but in many of them are found round or slightly alongated red chromatin bodies partially surrounded by or in close approximation to a somewhat larger deep-blue staining body. Some of the chromatin bodies approach 1 micron in diameter, but the majority are smaller and in these the protoplasm is elongated, extending well beyond the chromatin body at both ends.

Some of the bodies are found clearly without the cells and in the largest of these the red chromatin body is centrally located and surrounded entirely by the deep-blue staining protoplasm, the whole being crescentic in shape.

This method of preparing and staining blood smears has been repeated many times with proper controls of normal guinea-pig blood and with blood from pigs sick with diseases other than spotted fever, with the result that the bodies above described have never been found except in spotted fever blood.

There appears to be some resemblance between these bodies found in spotted fever guinea pig blood and those described by Seidelin as having been found by him in yellow fever blood; and in view of the criticism of Seidelin's work made by Wenyon and Low, who claim to have found similar bodies in normal guinea pig blood, one naturally hesitates to draw any definite conclusions from the finding here reported.

From the fact that these bodies, on account of their morphological and tinctorial characteristics, may be regarded as probably of protozoan nature, and because they have thus far been found only in blood from animals infected with spotted fever, it is felt that the publication of their description at this time is justified, in order that other workers may be on the lookout for them, and that their relationship to Rocky Mountain spotted fever may be fully established.

The writer is indebted to Surg. A. M. Stimson and Asst. Surg. R. R. Spencer for assistance in carrying on the above-described investigations.

Forget It

If you see a tall fellow ahead of a crowd,
A leader of men, marching fearless and proud,
And you know of a tale whose mere telling aloud
Would cause his proud head in grief to be bowed,
It's a pretty good plan to forget it.
If you know of a skeleton hidden away
In a closet, and guarded, and kept from the day
In the dark; and whose showing, whose sudden display,
Would cause grief and sorrow and lifelong dismay,
It's a pretty good plan to forget it.
If you know of a thing that will darken the joy
Of a man or a woman, a girl or a boy,
That will wipe out a smile or least way annoy
A fellow, or cause any gladness to cloy,
It's a pretty good plan to forget it.

—Parish and Home.

Elsie: "Mamma, I don't feel well." Mother: "That's too bad dear. Where do you feel the worst?" Elsie: "In school, Mamma."

Conditional Compromise.—Governess: You must forgive your little brother before you go to bed. You might die in the night.

Thomas (reluctantly): Well, I'll forgive him to-night, but if I don't die he'd better jolly well look out in the morning.—Exchange.

Communicable Diseases Reported to the State Board of Health for the Month of February, 1916.

Smallpox—Blaine, 6; Carbon, 3; Chouteau, 1; Custer, 3; Dawson, 3; Gallatin (Excl. of Bozeman) 1; Meagher, 4; Powell, 1; Silver, Bow (Excl. of Butte) 3; Butte, 3; Stillwater, 1; Valley, 2; Yellowstone (Excl. of Billings) 4; Billings, 1; Total, 36. Total last Month, 72.

Diphtheria—Missoula City, 1; Livingston, 1; Sheridan, 1; Butte, 1; Total, 4. Total last Month, 11.

Scarlet Fever—Anaconda, 2; Fallon, 33; Fergus, 2; Bozeman, 2; Lincoln, 2; Madison, 2; Missoula City, 1; Ravalli, 3; Richland, 1; Sheridan, 2; Butte, 1; Yellowstone (Excl. of Billings) 8; Total, 49. Total last Month, 46.

Typhoid Fever—Blaine, 20; Chouteau, 1; Custer, 2; Dawson, 1; Fergus, 1; Hill, 3; Helena, 1; Musselshell, 1; Livingston, 4; Valley, 5; Yellowstone, (Excl. of Billings) 1; Billings, 3; Total, 43. Total last Month, 26.

Measles—Blaine, 1; Cascade, (Excl. of Gt. Falls) 1; Great Falls, 1; Custer, 4; Dawson, 5; Flathead, (Excl. of Kalispell) 10; Kalispell, 3; Fergus, 3; Bozeman, 1; Hill, 1; Lincoln, 7; Madison, 22; Meagher, 5; Richland, 1; Sheridan, 17; Silver Bow, (Excl. of Butte) 6; Butte, 51; Stillwater, 1; Valley, 5; Yellowstone, (Excl. of Billings) 11; Billings, 86; Total, 242. Total last Month, 73.

Cerebro Spinal Meningitis—Yellowstone, (Excl. of Billings) 1; Total, 1. Total last Month, 1.

Tuberculosis—Great Falls, 7; Custer, 1; Sanitorium, 6; Madison, 1; Butte, 12; Total, 27. Total last Month, 14.

Whopping Cough—Helena, 4; Meagher, 1; Livingston, 5; Sheridan, 2; Billings, 5; Total, 17. Total last Month, 20.

Anterior Poliomyelitis—No cases reported. Last month 0.

Trachoma—No cases reported. Last month 0.

MONTANA STATE BOARD OF HEALTH.
Food and Water Laboratory.
Office of the Chemist.
SUMMARY OF SAMPLES ANALYZED.

	Passed	Not Passed	Total
Camphor liniment	6	3	9
Spirits peppermint	1	1	2
Epsom salts	1	....	1
Apple jelly	2	....	2
Cream	....	1	1
Milk	3	....	3
Salt (sodium chloride)	1	....	1
Butter	1	....	1
Hamburger	1	....	1
Bologna sausage	1	....	1
Weinerwurst	1	....	1
Salmon	....	1	1
Lard	5	3	8
Water	....	....	74
Total	23	9	106

Seventy-four samples of water were sent to this laboratory for chemical and bacteriological analyses. These samples were analyzed in the chemical and bacteriological laboratories respectively. The samples were collected from the following places: Armington, Armstead, Butte, Chinook, Choteau, Conrad, Great Falls, Hamilton, Lewiston, Livingston, Moore, and Three Forks.

Twenty samples were analyzed for their mineral content. These samples were submitted by the United States Geological Survey. Eight samples came from the western part of the state and twelve from the southwestern part of the state.

Thirty-two miscellaneous food and drug samples were analyzed in accordance with the tabulation above. Of this number twenty-three (23) were passed and nine were not passed.

BIRTHS (EXCL. OF STILLBIRTHS) REPORTED TO THE STATE BOARD OF HEALTH FOR THE MONTH OF FEBRUARY. 1916, AND COMPARATIVE BIRTH AND DEATH RATE IN THE STATE.

	Males	Females	Totals	Deaths	Excess of Births	Excess of Deaths
Beaverhead	4	4	8	9	...	1
Big Horn	..	...	...	2	...	2
Blaine	4	4	8	9	...	1
Broadwater	3	1	4	4	...	...
Carbon	16	9	25	6	19	...
Cascade Excl.of	13	9	22	10	12	...
Great Falls	31	31	62	19	42	...
Chouteau	8	12	20	6	14	...
Custer	9	13	22	7	15	...
Dawson	5	13	18	8	10	...
Deer Lodge Excl. of	1	...	1	5	...	4
Anaconda	14	10	24	24	...	...
Fallon	9	6	15	2	13	...
Fergus	26	17	43	10	33	...
Flathead Excl. of	9	7	16	9	7	...
Kalispell	5	6	11	2	9	...
Gallatin Excl. of	8	7	15	3	12	...
Bozeman	7	12	19	6	13	...
Granite	3	3	6	3	3	...
Hill	12	10	22	9	13	...
Jefferson	4	3	7	2	5	...
Lewis and Clark Excl. of	8	4	12	2	10	...
Helena	17	8	25	12	13	...
Lincoln	5	6	11	2	9	...
Madison	7	5	12	5	7	...
Meagher	7	9	16	4	12	...
Mineral	..	...	...	2	...	2
Missoula Excl. of	2	5	7	1	6	...
Missoula City	14	14	28	19	9	...
Musselshell	22	12	34	5	29	...
Park Excl. of	1	4	5	5	...	...
Livingston	6	8	14	2	12	...
Phillips	9	6	15	3	12	...
Powell	2	3	5	7	...	2
Prairie	6	6	12	1	11	...
Ravalli	10	4	14	4	10	...
Richland	12	7	19	2	17	...
Rosebud	4	6	10	3	7	...
Sanders	2	...	2	2	...	...
Sheridan	19	12	31	19	12	...
Silver Bow Excl. of	9	12	21	45	...	24
Butte	53	45	98	65	33	...
Stillwater	6	6	12	5	7	...
Sweet Grass	9	10	19	1	18	...
Teton	14	11	25	7	18	...
Toole	4	4	8	4	4	...
Valley	12	14	26	6	20	...
Wibaux	4	4	8	2	6	...
Yellowstone Excl. of	18	11	29	8	21	...
Billings	24	17	41	14	27	...
TOTALS	497	430	927	412	550	36
Stillbirths						25

DEATHS (EXCL. OF STILLBIRTHS) REPORTED TO THE STATE BOARD OF HEALTH FOR THE MONTH OF FEBRUARY, 1916, ARRANGED ACCORDING TO COUNTIES AND PRINCIPAL CITIES.

	Spotted Fever	Small Pox	Tuberculosis	Diphtheria	Scarlet Fever	Measles	Typhoid Fever	Meningitis	Anterior Poliomyelitis	Whooping Cough	Pneumonia	Nephritis	Organic Heart Disease	Malignant Tumors	Acute Intestinal Diseases	Violence	Suicide	Alcoholism	All Other Causes	Totals
Beaverhead											3		3	1					2	9
Big Horn											1								1	2
Blaine							1						2			2			4	9
Broadwater																3			1	4
Carbon											3								3	6
Cascade Excl. of											2	1		1		1		1	4	10
Great Falls			1							1	2	1		3		2		1	8	19
Chouteau							1										1		4	6
Custer													5						2	7
Dawson			1										2			1			4	8
Deer Lodge Excl. of														1					4	5
Anaconda										1	5	1	2	2		3			10	24
Fallon					1							1								2
Fergus											3	1	1			1	1		3	10
Flathead Excl. of			3								2	1					1		2	9
Kalispell																			2	2
Gallatin Excl. of								1					1						1	3
Bozeman												2	2						2	6
Granite													1						2	3
Hill							1			1	1	1				1	2		2	9
Jefferson										1						1				2
Lewis and Clark Excl. of										1		1								2
Helena										1	2	1					1		7	12
Lincoln														1		1				2
Madison										1		2	1						1	5
Meagher													1	2			1			4
Mineral													1			1				2
Missoula Excl. of																1				1
Missoula City			1							1	2	1	1	3		4			6	19
Musselshell			1													1			3	5
Park Excl. of			1								1	2							1	5
Livingston											1								1	2
Phillips											1	1	1							3
Powell													1			3			3	7
Prairie																1				1
Ravalli														1		1			2	4
Richland					1														1	2
Rosebud											1	1				1				3
Sanders			1											1						2
Sheridan			2				1	1			5	1				1			8	19
Silver Bow Excl. of			4								3	6	3	1		18		3	7	45
Butte			10								7	5	7	1		9	1	2	23	65
Stillwater											1		3						1	5
Sweet Grass																			1	1
Teton							1				1			3					2	7
Toole											1			1					2	4
Valley							1				1	1							3	6
Wibaux											1								1	2
Yellowstone Excl. of						1								1		2			4	8
Billings			1				1				6	1							5	14
TOTALS			26		2		4	6		3	58	28	42	26		59	8	7	143	412

Estimated population	420,000
Monthly death rate per 1,000 population	.980
Annual death rate per 1,000 population	11.76

CITRUS FRUITS.

During the seasons of 1913-14, 1914-15 and 1915-16 the Bureau of Chemistry, United States Department of Agriculture, has been making a study of citrus fruits, with the object of setting some standard to distinguish mature from immature fruits. In California and Florida corps of experts are working at the present time in the interests of American consumers. With data from three seasons with which to judge a properly matured fruit, we may well look forward to an improvement in the quality of oranges and grapefruit, so popular from coast to coast.

For many years producers have been sending immature fruit to the market, and artificially coloring by sweating while in transit. One has only to think of the distance of shipment to realize the ease with which this may be accomplished. The car is sealed, vents are closed, and if necessary shipment is delayed, and in the course of eight to ten days the green fruit that was shipped has, as far as appearance is concerned, been converted into the mature tree-ripened fruit. It has been proven by the Bureau of Chemistry, however, that the changes taking place in the fruit in the natural course of ripening and that change which takes place in the artificial process of sweating produces very different results. In the green fruit the acid content is high and the soluble solids or sugars low. The soluble solids may be equal to or slightly in excess of acids present. As the natural process goes on, certain principles in the green fruit are converted into soluble sugars, and thus the proportion between acids and soluble solids increases. In mature oranges this proportion may be as great as one-sixteenth, meaning one part of acidity to sixteen parts soluble solids. In sweating the green fruit this conversion seems to be retarded, prevented, or to take place only in part, thereby resulting in a green fruit disguised as a mature one. Green apples produce grave disorder in the digestive system, especially of children, and immature citrus fruits likewise cause a similar disturbance. Therefore it is obvious why the sale of immature citrus fruit should be prevented.

Some fruit companies are at present printing upon orange wrappers, "Color of this fruit accelerated by sweating." Whether or not this expression discharges the responsibilities of the producer or wholesale company is question-

able. Not many people read advertisements on orange wrappers at the time of purchase, and not many grocers call attention to the fact that "Our oranges are not as ripe as they appear." Probably 75 per cent. of grocery orders are placed over telephone, and chances of detecting immature fruit are few.

As a result of investigations carried on during the past seasons, the Bureau of Chemistry has adopted as a standard for oranges the ratio of one-eighth as the minimum proportion between acids and total soluble solids, and one-seventh for grapefruit, the acidity to be calculated as citric acid without water of crystalization. Citrus fruit having a narrower ratio than standards given will be considered immature and unfit for human consumption.

While it is to be regretted that some producers have brought discredit upon such valuable fruits, yet the result will undoubtedly be a better quality and increased demand.